

Public Health

"The neglected tropical diseases (NTDs), a group of chronic, debilitating, and poverty-promoting parasitic, bacterial, and some viral and fungal infections, are among the most common causes of illness of the poorest people living in developing countries."^a

Abiotic environmental factors are important in determining the distribution of disease-causing vectors and their life-cycles.

Temperature
Precipitation
Relative humidity
Solar radiation
Topography
Soil moisture
Presence & extent of fresh water rivers, ponds, lakes

Biotic factors – ecosystem structure and health
Human factors- Land use, social-economic



WHO is currently focusing on 17 neglected tropical diseases:

- Buruli ulcer
- Chagas disease
- Cholera/epidemic diarrhoeal diseases
- Dengue/dengue haemorrhagic fever
- Dracunculiasis (guinea-worm disease)
- Endemic Treponematoses (yaws, pinta, endemic syphilis...)
- Human African trypanosomiasis
- Leishmaniasis
- Leprosy
- Lymphatic filariasis
- Onchocerciasis
- Schistosomiasis
- Soil-transmitted helminthiasis
- Trachoma
- ❖ Yaws
- ❖ Rabies

Major NTD Target Sub-Regions and Unique Ecologies.

Scenario	Sub-Region	NTDs	Indigenous Populations	Co-Factors ^b
1	Southern cone of South America	Chagas, leishmaniasis, cysticercosis, echinococcosis, hemorragic fevers	+	Cattle ranching, minifundios, urban migration
2	Chaco (Bolivia, Paraguay, Argentina)	Chagas, leishmaniasis, STH	+++	Cattle ranching, minifundios, animal husbandry
3	Andean region (Altiplano or Highland)	Fascioliasis, Chagas, leishmaniasis, plague, bartonellosis, STH, cysticercosis, echinococcosis, ectoparasites	++++	Minifundios, urban migration
4	Amazonian basin	Chagas, leishmaniasis, STH, onchocerciasis, leprosy, trachoma, ectoparasites	++	Deforestation, mining, guerrillas, urban migration, indiscriminate colonization
5	Eastern Brazil	STH (esp. hookworm) schistosomiasis, Chagas disease, leishmaniasis, LF (NE only), echinococcosis, leprosy, leptospirosis	++	Cattle ranching, deforestation, minifundios, urban migration, monoculture
6	North Pacific of South America	STH, cysticercosis, leishmaniasis, onchocerciasis, echinococcosis	++	Deforestation, gold mining, guerrillas
7	Caribbean basin	STH, schistosomiasis, LF, leprosy, leptospirosis, fascioliasis	+	Economic dependence on tourism, deforestation, urban migration
8	Central America and Panama	STH, leishmaniasis, Chagas, onchocerciasis, cysticercosis, leptospirosis	+++	Deforestation, desertification, migration
9	South and Central Mexico	STH, Chagas, cysticercosis, leishmaniasis, trachoma, onchocerciasis	+++	Deforestation, migration
11	Northern Mexico	STH, Chagas, cysticercosis, leishmaniasis	++	Desertification, migration

^aHotez PJ, Molyneux DH, Fenwick A, Kumaresan J, Ehrlich Sachs S, et al. Control of neglected tropical diseases. *New Eng J Med*. 2007;357:1018-1027.

^b P. J. Hotez, M. E. Botazzi, C. Franco-Paredes, S. K. Ault, and M. R. Periago. 2008. The Neglected Tropical Diseases of Latin America and the Caribbean: A Review of Disease Burden and Distribution and a Roadmap for Control and Elimination. *PLoS Negl Trop Dis*. 2008 September; 2(9): e300.

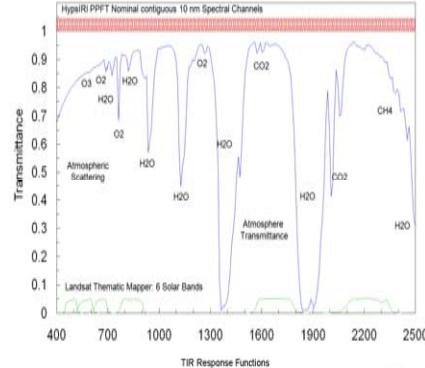
The Hyperspectral Infrared Imager (HypSIRI) Public Health & Air Quality Applications

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Air Quality (Dust)

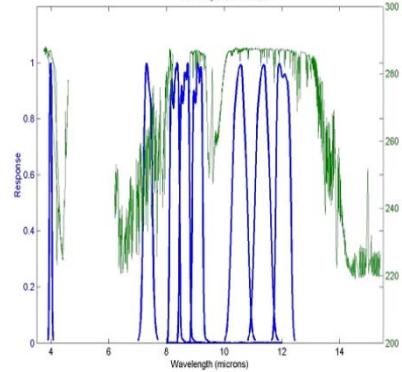


HypSIRI hyperspectral measurements would provide global measurements of surface mineralogy and biotic crusts important in assessing the impact of dust in human health.

HypSIRI surface thermal measurements would also help identify the variability of dust sources due to surface moisture conditions and map mineralogy



Middle East Dust – Trace Composition	
Links between selected elements and some known lung function conditions and diseases	
Mn (ppm)	Desert Dust <10 µm
Cr (ppm)	Desert Dust <40 µm
Co (ppm)	450 331.98
Pb (ppm)	25500 18111.61
Cu (ppm)	11.72 8.24
Cd (ppm)	17.22 9.45
Mg (ppm)	220 152.64
Al (ppm)	1.24 0.70
Ca (ppm)	13230.49 10572.70
Na (ppm)	15912.39 13154.60
Cr (ppm) [but species critical]	139577.64 140250.15
Zn (ppm)	1098.28 1476.86
Ni (ppm)	181.32 187.36
Ti (ppm)	105.18 72.30
Cancer	93.28 60.44
Cancer suspected	1095.52 539.81
Cancer & asthma	Emphysema
Asthma	

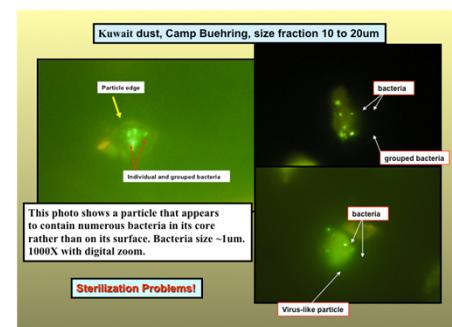
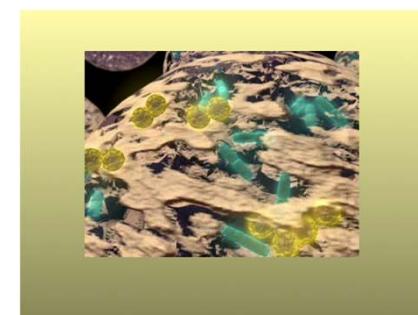


Biotic Crusts: where the action is



HypSIRI observations can be merged through a Land Data Assimilation System (LDAS) be used to drive spatially-explicit ecological models of NTD vectors distribution & life cycles. Assimilations will be driven by observational data LDAS and satellite-derived meteorological forcing data, parameter datasets, and assimilation observations, including:

Precipitation from TRMM, and GPM
Land Cover Type from HypSIRI
Soil Moisture from AMSR-E (where applicable), SMAP and HypSIRI.
Terrestrial Water Storage from GRACE and GRACE II.
Surface temperature, Vegetation Fraction/ Leaf Area Index, and canopy physiology from HypSIRI.
Topography from SRTM.



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